Chapter 14

Feeding Mature Adult Dogs: Middle Aged and Older

Jacques Debraekeleer
Kathy L. Gross
Steven C. Zicker

"Old dogs, like old shoes, are comfortable. They might be a bit out of shape and a little worn around the edges, but they fit well."
Bonnie Wilcox 'Old Dogs, Old Friends'

INTRODUCTION

For a number of reasons, the mature segment (six to eight years of age and older) of the pet dog population is growing. More than 35% of dogs in the U.S. are at least seven years old and, in Europe, the number of dogs older than seven years increased by about 50% from 1983 to 1995 (Lund et al, 1999; Kraft, 1998). In this chapter, mature dogs include dogs that are middle aged and older. In people, middle age is often considered as being approximately the third quarter of the average lifespan.

Aging increases vulnerability (Mosier, 1989; Hayflick, 1994). Aging isn't a disease; however, morbidity increases with age because normal changes make animals more vulnerable to diseases (Hayflick, 1994). The influence of nutrition on vulnerability to chronic or acute disease is difficult to evaluate, and has not been explored thoroughly in dogs. In people and companion animals, nutrition may be one of the more important aspects of geriatric care because delay or elimination of the two or three leading causes of death would profoundly affect life expectancy (Hayflick, 1994a). In dogs, the three leading non-accidental causes of death are cancer, kidney disease and heart disease (Bronson, 1982; MacDougall and Barker, 1984; MAF, 1991, 1998). Other diseases and disorders are also common (Table 13-1). Moreover, older animals seldom suffer from a single disease and one problem may markedly influence the course of another (Mosier, 1990).

The overall feeding goals for mature adult dogs are to optimize quality and longevity of life and minimize disease. To understand the specific nutritional needs of mature dogs, it is necessary to know the major effects of aging on canine body systems (**Box 14-1**). Aging is characterized by progressive and, usually, irreversible change (Mosier, 1988), and its rate and manifestations are determined by intrinsic and extrinsic factors, one of which is nutrition. Because aging is progressive, the point in time at which a food change should be made is arbitrary, and in a way philosophical. Dogs often are considered mature or likely to start having diseases associated with aging between seven and one-half and 13.5 years (Goldston, 1989). Smaller dogs tend to live longer than large dogs (**Table 14-1**). The life expectancy of smaller dogs may be more than 20 years. Because dogs are often considered older when they reach half of their life expectancy (Grandjean and Paragon, 1990), a food change should be considered around the age of five years for large- and giant-breed dogs and around seven years for small dogs (Markham and Hodgkins, 1989).

At these ages, dogs may gradually start to gain weight and develop age-related physical and behavioral changes (Armstrong and Lund, 1996; Markham and Hodgkins, 1989; Landsberg and Ruhl, 1997). Clinical signs of cognitive dysfunction and brain pathology associated with aging begin at about seven to eight years of age (Head et al, 2000).[a]

However, veterinarians should not accept the tenant that poor health and old age are synonymous (Goldston, 1989). There is a real opportunity to improve the quality and possibly

Box 14-1. The Mature Dog.

Aging is the progressive change that occurs after maturity in various organs and leads to decreased ability of an organism to meet environmental demands. This definition underscores two primary aspects of aging. First, aging occurs "after maturity." Although nutrition in young animals will have an affect on longevity and health, changes occurring during growth should not be considered aging. Second, aging results in a "decreased ability to meet the demands of the environment." Although young organisms adapt easily to fluctuations in nutrient intake and quality, mature animals may no longer be able to cope with excesses, borderline deficiencies or changes in nutrient intake and quality. Therefore, foods for mature dogs should meet allowances more rigorously and consistently because of lack of reserve capacity to handle large excesses and deficiencies.

An important feature of aging is that, compared with a group of younger adults, the mature dog population has a "large variation in health status" between individuals. In addition, diseases may be subclinical and not apparent by results of a physical examination; more in depth assessments are necessary, including diagnostic evaluations. Mature animals, therefore, must be evaluated individually rather than as a group and their nutritional needs determined accordingly.

The Bibliography for **Box 14-1** can be found at www.markmorris.org.

Table 14-1. Percent survival rates of mature dogs.*

Age	10 years	15 years
Small-breed dogs	38%	7.0%
Large-breed dogs	13%	0.1%

*Adapted from Deeb BJ, Wolf NS. Studying longevity and morbidity in giant and small breed dogs. Veterinary Medicine 1994; 89 (Suppl.7): 702-713.

the length of life of mature dogs through nutritional management. An important example is cognitive dysfunction (Chapter 35). Nutritional intervention in combination with mental stimulation can halt and even reverse its progression.

There is considerable interest in the potential benefits of pet nutrition on the part of pet owners. In one survey, 51% of respondents indicated that they were interested in learning about clinical signs and treatments for older pets and 47% were interested in pet nutrition (MAF, 2005).

PATIENT ASSESSMENT

History and Physical Examination

A thorough history should be taken and a physical examination performed to identify potential areas of nutritional concern. All of the considerations discussed for young adult dogs in Chapter 13 (i.e., breed, gender and health status) should be considered when developing key nutritional factors for mature dogs. Special attention should be directed to physiologic changes associated with aging and diseases that are more prevalent in mature animals such as renal disease, cancer, degenerative joint disease, cardiac disease, endocrine disorders, periodontal disease, cognitive dysfunction and obesity (Harvey et al, 1994; Alexander and Wood, 1984; Hoskins, 1995; Goldston, 1995; Landsberg and Ruhl, 1997). Many diseases may be subclinical, emphasizing the importance of a thorough evaluation.

This chapter builds on many of the recommendations in Chapter 13 for feeding young adult dogs. The minimum nutrient requirements of mature dogs are similar to those of young adult dogs. The few studies evaluating the effect of aging on the nutritional needs of dogs have shown minimal changes in nutrient requirements. Therefore, nutritional recommendations for mature dogs are based on risk factor management, extension of learning from other species and prudence. For several of the key nutritional factors for mature dogs, this results in reducing the recommended upper range of some nutrients, compared to that for young adult dogs. The only nutritional modification known to slow aging and increase the lifespan consistently in multiple species is caloric restriction. Reducing caloric intake by 20 to 30% of normal, while meeting essential nutrient needs, slows the aging process and reduces the risk for cancer, renal disease, arthritis and immune-mediated diseases in several animal models (Sheffy and Williams, 1981; Kealy et al, 2002). This level of restriction seems difficult to achieve in the long term but should be considered for incorporation into mainstream nutritional advice. Carefully monitoring food intake and body condition in mature dogs is important because these parameters may indicate underlying disease processes.

Laboratory and Other Clinical Information

Laboratory analyses become more important in health screening of dogs older than five years. All mature dogs should be screened for renal disease and hypertension. Chronic renal disease is best diagnosed with a urinalysis (i.e., urine specific gravity, urine protein, urine sediment examination) and a serum biochemistry profile, including urea nitrogen, creatinine, electrolyte, calcium and phosphorus measurements (DiBartola, 1995). Additional blood parameters should be evaluated based on historical and physical examination findings. Generally, indirect blood pressure measurements obtained routinely during hospital visits are reasonable estimates of a dog's true blood pressure (Remillard et al, 1991). However, uncooperative, anxious dogs may have elevated blood pressure values in the hospital setting that do not reflect normal values (Littman and Drobatz, 1995). Fundic examination may also detect changes associated with hypertension and other systemic diseases (Littman and Drobatz, 1995). Thoracic radiographs and echocardiography should be performed if a cardiac murmur is detected or if there is a history of coughing or an abnormal respiratory pattern.

Key Nutritional Factors

Veterinarians should appreciate the diversity in health status of

mature dogs and adapt care and nutrition to the specific needs of each patient (MacDougall and Barker, 1984; Knapp, 1964; Kronfeld, 1983). **Table 14-2** summarizes key nutritional factors for mature dogs. The following section describes these key nutritional factors in more detail. Most of these are the same as for young adult dogs. A more thorough discussion of the overlapping key nutritional factors can be found in the key nutritional factors section in Chapter 13.

Table 14-2. Key nutritional factors for foods for mature dogs.

Factors	Recommended food levels*	
	Normal weight and body condition	Inactive/ obese prone
Water	Free access	Free access
Energy density (kcal ME/g)	3.0-4.0	3.0-3.5
Energy density (kJ ME/g)	12.5-16.7	12.5-14.6
Crude fat (%)	10-15	7-10
Crude fiber (%)**	≥2	≥10
Protein (%)	15-23	15-23
Phosphorus (%)	0.3-0.7	0.3-0.7
Sodium (%)	0.15-0.4	0.15-0.4
Chloride (%)	1.5 x Na	1.5 x Na
Antioxidants (amount/kg food)		
Vitamin E (IU)	400	400
Vitamin C (mg)	≥100	≥100
Selenium (mg)	0.5-1.3	0.5-1.3
Food texture (VOHC Seal of Acceptance)	Reduced plaque accumulation	Reduced plaque accumulation

Key: kcal = kilocalories, kJ = kilojoules, ME = metabolizable energy, VOHC = Veterinary Oral Health Council Seal of Acceptance (Chapter 47).
*All foods expressed on a dry matter basis unless otherwise noted. If the caloric density of the food is different, the nutrient content in the dry matter must be adapted accordingly (Chapter 1).
**Crude fiber measurements underestimate total dietary fiber levels in food.

Water

Mature dogs are more prone to dehydration due to possible osmoregulatory disturbances, medications (diuretics) and chronic renal disease, with compromised urine concentrating ability. Therefore, continuous access to a fresh, clean water supply is very important and water intake should be routinely monitored.

Energy

With increasing age, lean body mass decreases, subcutaneous fat increases, basal metabolic rate gradually declines and body temperature may decrease. As dogs age, they become slower and less active, and their thyroid function may be impaired (Siwak et al, 2000; Armstrong and Lund, 1996; Finke, 1991; MacDougall and Barker, 1984; Mosier, 1990; Meyer, 1990; Sheffy et al, 1985). All these changes result in a 12 to 13% decrease in daily energy requirement by around seven years of age (Chapter 13, Table 13-2) (Kienzle and Rainbird, 1991). For mature dogs, a daily energy intake of 1.4 x resting energy requirement (100 kcal [418 kJ] metabolizable energy/$BW_{kg}^{0.75}$) is a good starting point (Leibetseder, 1989). This amount should be modified if a dog tends to lose or gain weight when fed at the recommended level. Very old dogs are often underweight and may have inadequate energy intake (Armstrong and Lund, 1996; Kronfeld, 1991; Donoghue et al, 1991). Underweight, very elderly people increase body weight when a food of higher caloric density is provided (Olin et al, 1996). Thus, it may be appropriate to feed a more energy-dense food to very old dogs. Because of the potential for mature dogs to have different energy needs, energy densities in foods recommended for this age group may vary from 3.0 to 4.0 kcal (12.6 to 16.7 kJ)/g dry matter (DM).

Fat

A relatively low fat intake helps prevent obesity in healthy mature dogs. However, some dogs may need different foods at seven years of age than they will at 13 years of age. Very old dogs may have a tendency to lose weight (Armstrong and Lund, 1996; Kronfeld et al, 1991). For these dogs, increasing the fat content of the food increases energy intake, improves palatability and improves protein efficiency (NRC, 1985; Schaeffer et al, 1989).

Research in people has indicated that increased energy intake can correct immunosenescence due to mild protein-energy malnutrition (Morley, 1994). The general condition of elderly people improved significantly by increasing the energy density of the food (Olin et al, 1996). Thus, a good balance should be maintained between preventing obesity and providing sufficient caloric intake.

Generally, fat levels between 7 and 15% DM are recommended for most mature dogs. Fat levels for obese-prone dogs should be between seven to 10%. The fat level should be selected as needed to meet the desired energy density to achieve ideal body weight and condition (body condition score 2.5/5 to 3.5/5). Essential fatty acid requirements should also be met as outlined for young adult dogs.

Fiber

Mature dogs are prone to develop constipation (Twedt, 1993), which may justify increased fiber intake. Additionally, fiber added to foods for obese-prone mature dogs dilutes calories. Fiber also decreases postprandial glycemic effects in diabetic dogs (Nelson, 1989). Very old dogs that tend to lose weight, however, should be offered a food with increased caloric density. The recommended levels of crude fiber in foods intended for mature dogs are at least 2% (DM).

Protein

Recommendations for protein intake in mature dogs are controversial, which parallels the debate in people (Pellet, 1990). The decrease in lean body mass, seen with age, together with alterations in protein synthesis and turnover have been the basis for the argument that protein intake in mature dogs should be higher than for younger adults (Grandjean and Paragon, 1990; Kronfeld, 1983; Wannemacher and McCoy, 1966). In contrast, other investigators have recommended reduced protein intake because of the increased prevalence of

renal pathology in dogs older than five years of age (Leibetseder and Neufeld, 1991; Lewis et al, 1987).

As with all lifestages, healthy mature dogs should receive enough protein and energy to avoid protein-energy malnutrition. Improving protein quality, rather than increasing its intake, can provide sufficient protein (Sheffy et al, 1985; Leibetseder, 1989; Mundt, 1989). Additionally, data suggest that mild protein-energy undernutrition in older people plays a role in immunosenescence; however, supplementation with calories returned helper T cells and suppressor cells to values seen in younger people (Morley, 1994). Serum protein concentrations, lymphocyte counts and muscle protein-to-DNA ratios have indicated that foods with 18% DM protein are adequate to maintain immunocompetence in older dogs (Finco et al, 1994). These findings confirmed earlier observations that foods with 16 to 20% DM protein are sufficient to maintain nitrogen balance and protein stores in older dogs (Wannemacher and McCoy, 1966). In addition, alterations in protein metabolism and plasma protein concentrations seen in healthy elderly people are unrelated to daily protein intake, suggesting that other factors play a role (Munro et al, 1987).

High protein intake has not been shown to contribute to the development of kidney disease in healthy animals. However, after kidney function is impaired, protein may play a role in progression of renal disease. In a four-year study with uninephrectomized healthy dogs, investigators recognized no difference in kidney function between dogs receiving a food with 34% DM protein and a food with 18% DM protein (Finco et al, 1994). However, histologic examination revealed an increase in mesangial matrix scores and fibrosis in the high-protein group (Finco et al, 1994). Mesangial proliferation has been described in glomerulonephritis and chronic interstitial nephritis in dogs (Müller-Peddinghaus and Trautwein, 1977a; Spencer and Wright, 1981) and may indicate more rapid renal impairment at a higher protein intake (Finco et al, 1994). Moderately reduced protein intake during early stages of canine renal disease improved the subjects' general condition (Leibetseder and Neufeld, 1991). In conclusion, commercial foods containing 15 to 23% DM protein provide sufficient protein for apparently healthy mature dogs.

Phosphorus

Some degree of clinical or subclinical renal disease is often present in mature dogs; as many as 25% of all dogs may be affected (Oehlert and Oehlert, 1976; Rouse and Lewis, 1975; Shirota et al, 1979; Leibetseder and Neufeld, 1991; Bloom, 1954; Crowell and Finco, 1975; Müller-Peddinghaus and Trautwein, 1977). Excessive phosphorus intake should therefore be avoided (Finco et al, 1992). Researchers have observed that dogs with advanced renal disease had slowed progression and reduced severity of renal disease when phosphorus levels in foods were decreased, thereby improving survival time (Brown et al, 1991; Finco et al, 1992; Lopez-Hilker et al, 1990). The minimum recommended DM allowance of phosphorus for foods for adult dogs is 0.3% (NRC, 2006). Therefore, foods for mature dogs should contain 0.3 to 0.7% DM phosphorus.

Sodium and Chloride

There is no nutritional need for the higher levels of sodium and chloride found in some commercial dog foods, especially considering the increased prevalence of heart and renal disease in mature dogs (Detweiler and Patterson, 1965; Whitney, 1974). High sodium chloride intake may be harmful in diseases that have a hypertensive component. Secondary hypertension is associated with obesity, chronic renal disease and some endocrinopathies, which are frequently seen in mature dogs (Anderson and Fisher, 1968; Cowgill and Kallet, 1986; Rocchini et al, 1987; Littman, 1990; Ross, 1992). Mature dogs with heart disease have decreased ability for eliminating excess dietary sodium (Chapter 36). Kidney disease and certain other diseases with a hypertensive component may be subclinical in their early phases. The minimum recommended allowance for sodium in foods for healthy adult dogs is 0.08 % DM; this recommendation is based on foods with a DM energy density of 4 kcal/g (NRC, 2006). For purposes of risk factor management, the recommended range for dietary sodium in foods for mature dogs is 0.15 to 0.4% DM, which is more than adequate. Some commercial all-purpose foods contain more than 2% DM sodium. Although the chloride requirement of dogs has not been established, a chloride level 1.5 times the sodium requirement is a reasonable recommendation.

Antioxidants

The consequences of prolonged oxidative stress (i.e., free radical damage) to cell membranes, proteins and DNA contribute to and/or exacerbate a wide variety of degenerative diseases including those listed in Table 13-1. In addition to these diseases, cognitive dysfunction was shown to affect 28% of dogs between 11 and 12 years of age and 68% of dogs 15 to 16 years old. Cognitive dysfunction is responsive to certain combinations of antioxidants (Chapter 35).

The consequences of free radical damage to cells and tissues have also been associated with the effects of aging. Although aging is a complex, multifactorial process, one explanation for many of the degenerative changes associated with aging is the free radical theory of aging (Harman, 1956). This theory proposes that free radicals produce cell damage and that age-dependent pathologic alterations may, at least in part, be the cumulative result of these changes.

Many phenomena initiate free radical formation within the body. Although environmental pollutants and radiation are direct and indirect sources of free radicals, the primary source is endogenous from normal oxidative metabolism. However, the body defends itself against the effects of free radicals through a complex network of protective antioxidant compounds.

Antioxidants protect biomolecules by scavenging free radical compounds, minimizing free radical production and binding metal ions that might increase the reactivity of poorly reactive compounds. In addition, many antioxidants exhibit second messenger regulatory function, cell cycle signaling and control of gene expression (Chapter 7). Also, combinations of antioxidants are more effective in relieving oxidative stress than are individual antioxidants.

The following key nutritional factor recommendations focus on the antioxidant vitamins E and C and on selenium as an essential component of the antioxidant enzyme, glutathione peroxidase. These compounds make up the list of antioxidant key nutritional factors because: 1) they are biologically important, 2) they act synergistically (e.g., vitamin C regenerates vitamin E after it has reacted with a free radical), 3) they are safe and 4) information regarding inclusion levels in pet foods is usually available. For improved antioxidant performance, foods for mature dogs should contain at least 400 IU vitamin E/kg (DM) (Jewell et al, 2000), at least 100 mg vitamin C/kg (DM) and 0.5 to 1.3 mg selenium/kg (DM).

Food Texture

Oral disease is the most common health problem in mature dogs and may predispose affected patients to systemic complications (DeBowes et al, 1996). Both veterinary care and home care are important in the treatment and prevention of periodontal disease. Foods designed to reduce the accumulation of dental substrates (e.g., plaque) and help control gingivitis and malodor are an important part of an oral home-care program for mature dogs (Chapter 47). If the labels of such foods carry the Veterinary Oral Health Council (VOHC) seal for plaque control, they have been successfully tested according to specific protocols and shown to be clinically effective in reducing accumulation of plaque. However, with older dogs, it is best if an adequate periodontal management program is in place (veterinarian/client/patient) so that there is sufficient periodontal health to ensure that the patient can chew the product (Chapter 47).

Other Nutritional Factor

Calcium

Osteoporosis occurs frequently in older people but is not a clinical problem in mature dogs (Weigel and Alexander, 1981). This finding is probably due, in part, to lifetime feeding of calcium-replete commercial foods to most dogs. There should be little concern about calcium deficiency in mature dogs unless unbalanced homemade foods are fed. Foods with 0.4 to 0.8% DM calcium are recommended for mature dogs. The calcium-phosphorus ratio should not be less than 1:1.

FEEDING PLAN

Mature dogs are more prone to obesity, degenerative joint disease, cardiac disease, renal disease, cognitive dysfunction and metabolic aberrations. They also are usually less active than young adult dogs. The feeding plan should be based on potential risk factors and information attained in the assessment. Because of the larger variation in health among mature dogs, more attention should be paid to individual needs. Nutritional surveillance is more important for mature dogs than for young adult dogs; therefore, the number of veterinary assessments per year should be increased. Goals remain the same as listed in the introduction; however, each patient should be evaluated individually.

Assess and Select the Food

Assessment of the food for mature dogs is similar to those procedures outlined for young adult dogs in Chapter 13. Compare the current food's key nutritional factor levels with the key nutritional factors reviewed above, identify discrepancies between key nutritional factor levels and current intake and decide whether food changes are required. **Table 14-3** compares key nutritional factor levels in selected commercial foods formulated for mature dogs to the key nutritional factor recommendations. Check with manufacturers for key nutritional factor content of foods not found in **Table 14-3**. Contact information can be found on pet food labels, websites or published information. Also, as with young adult dogs, the pet food label should indicate that the product has been approved by a regulatory agency such as the Association of American Feed Control Officials (AAFCO) (Chapter 9).

Commercial treats, snacks and table food should also be included in the food assessment step. Excessive feeding of treats and snacks may markedly affect the cumulative nutritional profile (Chapter 13, Box 13-4). The impact of snacks on daily nutrient intake depends on two factors: 1) the nutrient profile of the snack and 2) the number provided. Thus, if snacks are fed, it is prudent to recommend those that best match the key nutritional profile recommended for mature dogs. Because meeting nutrient requirements is not the primary goal of feeding treats, many commercial treats are not complete and balanced. However, a few treats are complete and balanced and are approved by AAFCO, or some other credible regulatory agency. Most table foods are not nutritionally complete and balanced and may contain high levels of fat or sodium and other minerals. If snacks are fed, it is simplest to recommend that they be commercial treats that, if possible, match the nutritional profile recommended for a particular lifestage (see product label). Generally, snacks should not be fed in excessive amounts (<10% of the total diet on a volume, weight or calorie basis). Otherwise, the nutritional composition of the snack and food should be combined and assessed.

Assess and Determine the Feeding Method

It may not be necessary to change the feeding method when managing healthy mature dogs. However, a thorough evaluation includes verification that an appropriate feeding method is being used.

The feeding method should be monitored more closely in mature than in younger dogs. Free-choice feeding should not be used for obese or overweight patients; however, this method may be preferred for thinner, very old animals to allow increased food intake. It is very important to measure food intake of mature dogs; this measurement may be more accurate when dogs are meal fed. Measures to stimulate food intake may be necessary for some very old dogs. Most mature adult dogs adapt well to new foods, but some patients may have difficulty. It is always good practice to allow for a transition period to avoid digestive upsets. This is particularly true when switching from lower to higher fat foods. The new food should be increased and the old food decreased in progressive amounts

Table 14-3. Comparison of recommended levels of key nutritional factors for foods for mature adult dogs with levels in selected commercial foods.*

Dry foods	**Energy density (kcal/cup)****	**Energy density (kcal ME/g)**	**Fat (%)**	**Fiber (%)**	**Protein (%)**	**P (%)**	**Na (%)**	**Vit E (IU/kg)**	**Vit C (mg/kg)**	**Se (mg/kg)**	**VOHC plaque*** (Yes/No)**
Recommended levels (normal body condition)	**-**	**3.0-4.0**	**10-15**	**≥2**	**15-23**	**0.3-0.7**	**0.15-0.4**	**≥400**	**≥100**	**0.5-1.3**	**-**
Hill's Science Diet Mature Adult 7+ Original	363	4.0	15.8	4.2	19.3	0.58	0.18	700	271	0.41	No
Hill's Science Diet Oral Care Adult	273	3.8	15.5	10.1	25.1	0.65	0.24	564	175	0.62	Yes
Iams Eukanuba Medium Breed Senior	350	4.6	12.8	2.2	29.3	0.95	0.40	236	83	na	No
Medi-Cal Dental Formula	280	na	12.7	5.3	19.7	0.9	0.4	na	na	na	No
Nutro Natural Choice Senior	267	3.8	12.1	2.2	23.1	1.21	0.27	275	99	0.49	No
Purina ONE Senior Protection Formula	375	4.1	14.0	3.4	32.3	1.12	0.30	1,012	na	0.99	No
Purina Pro Plan Chicken & Rice Senior	408	4.2	15.6	2.3	30.4	1.14	0.44	na	na	na	No
Royal Canin MINI Aging Care 27	378	4.3	17.4	1.7	29.3	0.71	0.33	717	326	0.22	No
Moist foods	**Energy density (kcal/can)****	**Energy density (kcal ME/g)**	**Fat (%)**	**Fiber (%)**	**Protein (%)**	**P (%)**	**Na (%)**	**Vit E (IU/kg)**	**Vit C (mg/kg)**	**Se (mg/kg)**	**VOHC plaque*** (Yes/No)**
Recommended levels (normal body condition)	**-**	**3.0-4.0**	**10-15**	**≥2**	**15-23**	**0.3-0.7**	**0.15-0.4**	**≥400**	**≥100**	**0.5-1.3**	**-**
Hill's Science Diet Gourmet Beef Entrée Mature Adult 7+	164/5.8 oz. 368/13 oz.	4.0	14.4	1.6	18.8	0.52	0.16	316	na	0.70	No
Hill's Science Diet Gourmet Turkey Entrée Mature Adult 7+	369/13 oz.	4.1	12.8	2.1	19.4	0.62	0.17	426	na	0.83	No
Hill's Science Diet Savory Chicken Entrée Mature Adult 7+	155/5.8 oz. 347/13 oz.	3.8	13.1	1.6	18.4	0.57	0.16	520	na	0.82	No
Dry foods†	**Energy density (kcal/cup)****	**Energy density (kcal ME/g)**	**Fat (%)**	**Fiber (%)**	**Protein (%)**	**P (%)**	**Na (%)**	**Vit E (IU/kg)**	**Vit C (mg/kg)**	**Se (mg/kg)**	**VOHC plaque*** (Yes/No)**
Recommended levels (inactive/obese prone)	**-**	**3.0-3.5**	**7-10**	**≥10**	**15-23**	**0.3-0.7**	**0.15-0.4**	**≥400**	**≥100**	**0.5-1.3**	**-**
Hill's Science Diet Light Adult	295	3.3	8.8	14.6	24.5	0.58	0.23	586	276	0.45	No
Iams Eukanuba Medium Breed Weight Control	275	4.2	10.5	1.9	21.3	0.76	0.50	206	42	0.34	No
Iams Weight Control	328	4.2	12.5	2.8	22.2	0.85	0.37	103	44	0.35	No
Medi-Cal Weight Control/Mature	320	na	8.5	4.0	19.5	0.8	0.2	na	na	na	No
Nutro Natural Choice Lite	244	3.4	7.2	4.4	16.7	1.22	0.33	161	67	0.44	No
Purina Pro Plan Chicken & Rice Weight Management	337	3.7	10.2	2.7	30.5	1.06	0.27	503	na	0.33	No
Royal Canin MINI Weight Care 30	326	3.8	12.0	6.2	32.6	0.82	0.33	652	326	0.16	No
Moist foods†	**Energy density (kcal/can)****	**Energy density (kcal ME/g)**	**Fat (%)**	**Fiber (%)**	**Protein (%)**	**P (%)**	**Na (%)**	**Vit E (IU/kg)**	**Vit C (mg/kg)**	**Se (mg/kg)**	**VOHC plaque*** (Yes/No)**
Recommended levels (inactive/obese prone)	**-**	**3.0-3.5**	**7-10**	**≥10**	**15-23**	**0.3-0.7**	**0.15-0.4**	**≥400**	**≥100**	**0.5-1.3**	**-**
Hill's Science Diet Light Adult	322/13 oz.	3.4	8.6	9.7	19.5	0.51	0.31	385	na	0.78	No
Medi-Cal Weight Control/Mature	370/396 g	na	10.0	5.5	21.5	0.6	0.3	na	na	na	No

Key: ME = metabolizable energy, na = information not published by manufacturer, Fiber = crude fiber, Se = selenium, P = phosphorus, Na = sodium, VOHC = Veterinary Oral Health Council, na = information not available from manufacturer, g = grams.

*From manufacturers' published information or calculated from manufacturers' published as-fed values; all values are on a dry matter basis unless otherwise stated.

**Energy density values are listed on an as fed basis and are useful for determining the amount to feed; cup = 8-oz. measuring cup. To convert to kJ, multiply kcal by 4.184.

***An adequate periodontal management program should be in place (veterinarian/client/patient) to ensure that there is sufficient periodontal health to enable the patient to chew these products.

†The manufacturers of most of the foods listed for inactive/obese-prone dogs recommend these foods for young adults.

over a three- to seven-day period until the changeover is completed (Nott et al, 1993) (Chapter 1). **Table 14-4** summarizes feeding recommendations for mature adult dogs.

REASSESSMENT

Nutritional status for healthy mature dogs should be assessed at least every six to 12 months. Immediate reassessment should take place if clinical signs arise that indicate the current nutritional regimen is inappropriate or if the dog's needs change due to altered use.

ENDNOTE

a. Zicker SC. Hill's Pet Nutrition, Inc., Topeka, KS. U.S. Marketing Research Summary: Omnibus Study on Aging Pets. Data on file. November 2000.

REFERENCES

The references for **Chapter 14** can be found at www.markmorris.org.

Table 14-4. Feeding plan summary for mature dogs.

1. Select a food or foods with levels of key nutritional factors listed in **Table 14-3**; for foods not in this table, contact the manufacturer for levels of key nutritional factors in the food in question.
2. The selected food should also be approved or meet requirements established by a credible regulatory agency (e.g., AAFCO).
3. Body condition and other assessment criteria will determine the DER. DER is calculated by multiplying RER by an appropriate factor (Table 5-2). Remember, DER calculations should be used as guidelines, starting points and estimates for individual dogs and not as absolute requirements.
   Dogs in ideal body condition =
   3.0 to 4.0 kcal (12.5 to 16.7 kJ) ME/g DM
   Inactive/obese-prone dogs =
   3.0 to 3.5 kcal (12.5 to 14.6 kJ) ME/g DM
4. Determine the preferred feeding method (Table 13-5); when the correct amount of food is fed; meal-restricted feeding is least likely to result in obesity.
5. For food-restricted meal feeding, estimate the initial quantity of food based on DER calculation (DER ÷ food energy density). Food energy density can be obtained from **Table 14-3** or from the manufacturer.
6. Monitor body weight, body condition and general health. These parameters are used to refine the amount to feed.

Key: AAFCO = Association of American Feed Control Officials, DER = daily energy requirement, RER = resting energy requirement, ME = metabolizable energy, DM = dry matter.

CASE 14-1

Feeding a Mature Miniature Pinscher

Jacques Debraekeleer, DVM
Hill's Science and Technology Center
Etten Leur, The Netherlands

Kathy L. Gross, PhD
Hill's Science and Technology Center
Topeka, Kansas, USA

Patient Assessment

An eight-year-old intact male miniature pinscher was examined as part of a routine health maintenance program. The owners saw a magazine article recently promoting preventive health programs for mature dogs. They realized that their dog was aging but had not noticed any specific problems.

The dog weighed 4.5 kg and had an optimal body condition score (BCS 3/5). Physical examination was normal except for a slightly enlarged prostate gland, mild periodontal disease and a grade II/VI holosystolic cardiac murmur loudest over the mitral valve. Results of a complete blood count, serum biochemistry profile, urinalysis and ocular fundic examination were normal. Thoracic radiographs were normal with no evidence of cardiomegaly or pulmonary disease.

Assess the Food and Feeding Method

The dog was fed several different kinds of commercial moist grocery brand dog foods and commercial jerky-type dog treats. Ice cream was also fed regularly. The owners were somewhat concerned because the dog did not seem to be eating as much as it did previously.

Questions

1. What are the key nutritional factors that should be considered in this patient?
2. Outline a feeding plan (foods and feeding method) for this dog.
3. How should the owner's concern about the reduction in appetite be addressed?

Answers and Discussion

1. Key nutritional factors for mature dogs include water, energy, fat, fiber, protein, phosphorus, sodium, chloride, antioxidants and food texture. Chronic progressive renal disease is a leading cause of morbidity and mortality in mature dogs. However, classic diagnostic tests such as the serum biochemistry profile and urinalysis that were performed for this dog will not detect renal disease until it is advanced. Although not definitively proven, dogs with subclinical renal disease may benefit from foods that avoid excess levels of phosphorus, protein, sodium and chloride. Clean water should also be available at all times. In general, fat levels between 7 and 15% dry matter (DM) are recommended for most mature dogs. Fat levels and energy density of the food should be adjusted based on the body condition of the patient. Obese-prone mature dogs may benefit from lower fat, less energy-dense foods whereas very old dogs often lose weight and need higher fat, more energy-dense foods. Increased levels of dietary fiber may be important for obese-prone mature dogs and those with constipation. Oral disease is the most common health problem of mature dogs; more than two-thirds of mature dogs suffer from significant periodontal disease. Both veterinary care and home care are important in treatment and prevention of periodontal disease. Foods formulated to decrease the accumulation of dental plaque and help control gingivitis and malodor are an important part of the oral home-care program for mature dogs.
2. Commercial moist grocery brand dog foods may contain excessive levels of phosphorus, fat, energy, protein, sodium and chloride. Jerky-type commercial treats also contain excessive levels of protein, fat, sodium and chloride. Mature healthy dogs may benefit from commercial foods for "senior" or "geriatric" dogs and treats that contain lower yet adequate levels of these nutrients. Excessive levels of dietary sodium and chloride should also be avoided in mature dogs with evidence of cardiac disease. Ice cream should also be discontinued as a regular treat or offered in smaller amounts. Moist foods do not provide textural characteristics that prevent the accumulation of dental plaque. Dental foods formulated to improve oral health are available and would be appropriate for this patient. The dog's body condition suggests that the current caloric intake is appropriate and should be maintained if a new food is selected. The estimated daily energy requirement (DER) should be 1.6 to 1.8 x resting energy requirement (RER) (330 to 370 kcal, 1,390 to 1,550 kJ). The feeding method will be dictated somewhat by whether a moist, dry, semi-moist or homemade food is fed. Moist and homemade foods should be fed once or twice daily as discrete meals, whereas dry or semi-moist food may be fed free choice and left out for prolonged periods.
3. The optimal BCS suggests that the dog is eating an appropriate amount of food. There may be several reasons why the owners expressed concern about the amount of moist food eaten by the dog. The moist foods currently fed are probably high in fat and energy dense; as little as one-half to two-thirds of a standard 400- to 450-g can will meet this dog's DER. The addition of jerky-type treats and ice cream would also decrease the amount of food the dog needed. Mature dogs may not be as active as they were earlier in life, which decreases their energy requirements. Periodontal disease was recognized during the physical examination and significant oral pain will discourage eating in some patients. Finally, an underlying disease may be contributing to partial anorexia despite the normal diagnostic results. All these factors should be explained to the owners and they should be encouraged to monitor food intake and body condition closely.

Progress Notes

The food was changed to a commercial moist specialty brand food formulated for mature dogs (Science Diet Mature Adult 7+ Canine[a]). The dog was fed three-fourths of a large can per day. The commercial jerky-type treats and ice cream were discontinued and replaced with a dry treat formulated for mature dogs. The dog was given two treats per day. A thorough oral examination including dental prophylaxis and polishing was recommended.

Endnote

a. Hill's Pet Nutrition, Inc., Topeka, KS, USA.